ANNUAL REPORT FOR 2002

Lengyel Mitigation Site
Craven County
Project No. 8.1170806
TIP No. B-2531WM

Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
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SUMMARY

The following report summarizes the monitoring activities that have occurred in the fourth year of monitoring for hydrology and vegetation at the Lengyel Mitigation Site. The Lengyel Mitigation Site is a brackish marsh restoration/preservation site divided into two areas. The first area is a reference marsh ecosystem (preservation) that contains two surface water gauges and one groundwater gauge. The second area is a restoration site that also contains two surface water gauges and one groundwater gauge. The reference marsh is to be used as a determination of hydrologic success if the restoration area does not meet established success criteria.

The year 2002 represents the fourth year of hydrologic monitoring for the Lengyel Mitigation Site. While one surface gauge indicated constant surface water throughout the growing season, the other three gauges indicated that the site was inundated for a minimum of 25% of the growing season. Hydrologic data collected for groundwater gauges showed continuous saturation for a period exceeding 25% of the growing season.

The success criteria for vegetation sampling follow the most recent guidelines from the National Marine Fisheries Service guidelines. Vegetation data did not meet the established success criteria. The percent frequency of the target species has dropped slightly due to the presence of many other wetland species throughout the site. However, the vegetation scale value has increased significantly and is on target to meet success criteria next year. Additional observations include the sighting of ospreys on the nesting pole and the presence of crabs and other aquatic organisms in the constructed tidal swale.

NCDOT recommends the continued monitoring of the Lengyel Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The Lengyel Mitigation Site is a 13.198-acre brackish marsh restoration/preservation project located in Craven County, North Carolina. The site is located east of the intersection of US 70 and US 70 Business and provides compensatory mitigation for impacts associated with the construction of the US 17 Neuse River Bridge (TIP No. B-2531) (Figure 1). Mitigation goals for the site include approximately 6.54 acres of brackish marsh restoration, 5.25 acres of brackish marsh preservation, and 0.85 acres of upland buffer. The site was constructed in April of 1998; however, planting activities were not complete until April 1999. The fourth year of monitoring at the site has just been completed.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years. Vegetation success criteria are based on the National Marine Fisheries Service guidelines. Hydrologic success criteria are based on federal guidelines for wetland mitigation. The following report details the results of hydrologic and vegetation monitoring during the 2002 growing season at the Lengyel mitigation site. Included in this report are analyses of hydrologic and vegetative monitoring results, discussion of local climate conditions throughout the growing season, and updated site photos.

1.3 Project History

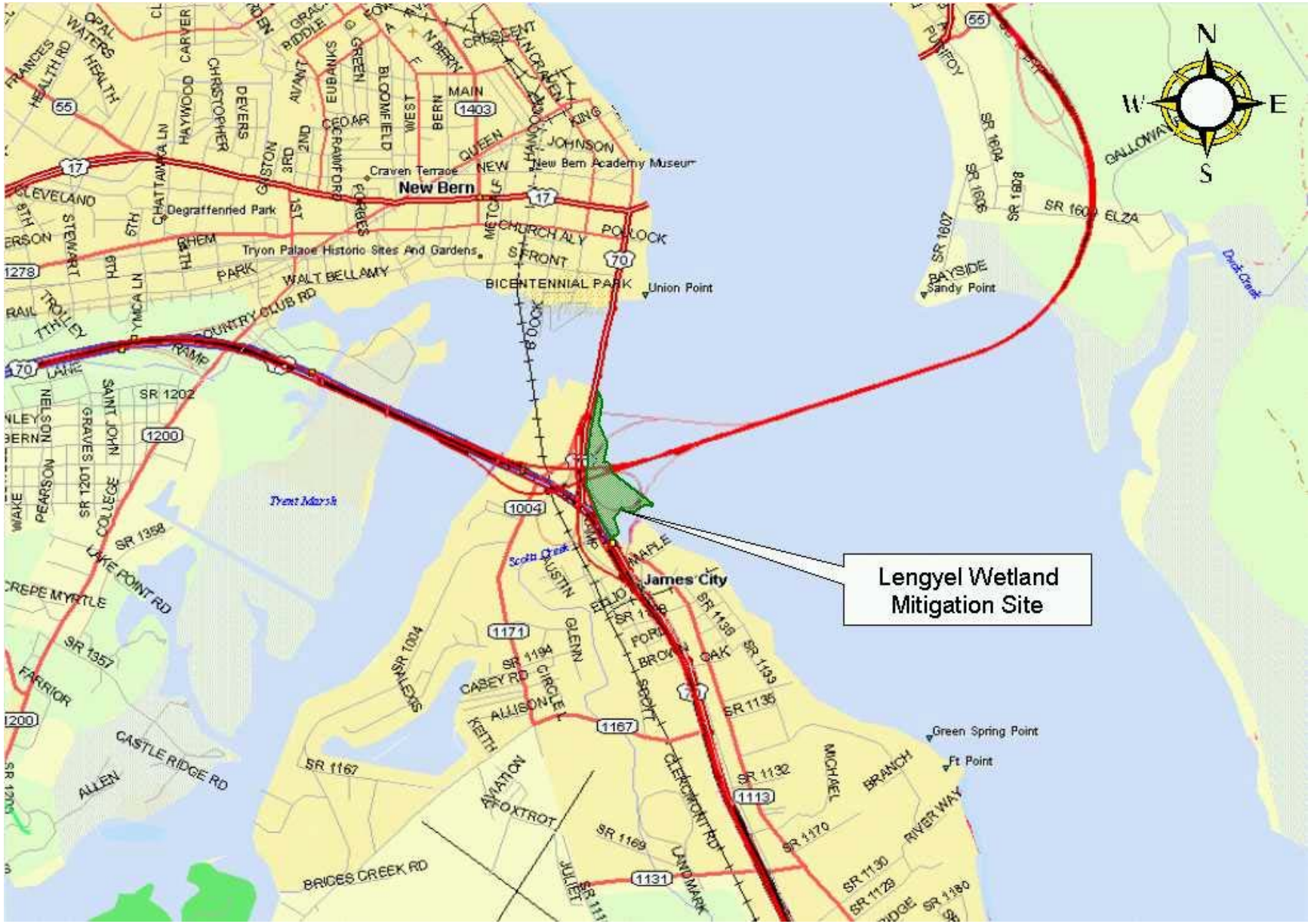
April 1998	Site Construction Began
April 1998	Site planted (Phase I)
March 1999	Surface Water Gauges Installed
April 1999	Planting Completed (Phase II)
June 1999	Site Construction Finished
April-November 1999	Hydrologic Monitoring (1 yr.)
October 1999	Vegetation Monitoring (1 yr.)
March-November 2000	Hydrologic Monitoring (2 yr.)
August 2000	Vegetation Monitoring (2 yr.)
October 2000	Two Groundwater Gauges Installed
March-November 2001	Hydrologic Monitoring (3 yr.)
August 2001	Vegetation Monitoring (3 yr.)
March-November 2002	Hydrologic Monitoring (4 yr.)
July 2002	Vegetation Monitoring (4 yr.)

1.4 Debit Ledger

Table 1. Lengyel Mitigation Site Debit Ledger

Site Habitat	Mitigation Plan			TIP Debit
	Acres at Start	Acres Remaining	% Remaining	B-2531
Marsh restoration	7.2	5.64	78.33	1.56
Marsh preservation	4.7	4.7	100.00	
Total	**11.9**	**10.34**	**86.89**	

Figure 1. Site Location Map



2.0 HYDROLOGY

2.1 Success Criteria

The hydrologic success criteria established for the Lengyel Mitigation Site includes: 1) site inundation or saturation within 12 inches of the ground surface for 25 percent of the growing season, or should the restoration fail to meet this criteria, 2) statistical comparison between the reference marsh area and the restoration area to determine if hydrology is significantly different. The site specific criteria are more stringent than the current federal guidelines that require a site to be inundated or saturated (within 12" of the surface) by surface or groundwater for a consecutive 5 - 12.5% of the growing season. Areas inundated or saturated less than 5% of the growing season are classified as non-wetlands.

The growing season in Craven County begins on March 18 and ends November 14. The dates correspond to a 50% probability that air temperature will drop to 28° F or lower after March 18 and before November 14.[1] Thus the growing season is 240 days; the established minimum hydrology requires 25% of this season, or 60 days. Local climate must represent average conditions for the area.

2.2 Hydrologic Description

A combination of wave action, wind-driven tides, rainfall, and high water is expected to keep the marsh consistently inundated; therefore, surface gauges were installed to record surface water levels. Four surface water gauges were installed at the site on March 31, 1999 (Figure 2). Automatic readings are taken at three-hour intervals daily throughout the growing season. Two additional groundwater gauges were installed on October 2, 2000 to maintain compliance with the CAMA, USACE, and NCDWQ permit conditions. The groundwater gauges record water levels on a daily basis. No rain gauge is located on the site, so rainfall data from a New Bern rain gauge (data supplied by the NC State Climate Office) is used to supplement the site's data. The data collected in 2002 represents the fourth full growing season for hydrologic monitoring.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The maximum number of consecutive days that saturation within 12 inches of the ground surface occurred was determined for each groundwater monitoring gauge. This number was converted into percentage of the 240 day growing season (March 18 – November 14).

Table 2 provides all of the 2002 hydrologic results. All four of the surface gauges showed continuous site inundation or saturation; as was required, site inundation

[1] Soil Conservation Service, Soil Survey of Craven County, North Carolina, 1989.

exceeded 25 percent of the growing season. Both of the groundwater gauges also indicated saturation or inundation for more than 25% of the growing season. In addition, the final data from the constructed site was comparable to the results from gauges located in reference areas.

Table 2. 2002 Hydrologic Monitoring Results

Monitoring Gauge	< 5.0%	5.0 – 12.5%	12.5 - 25.0%	> 25.0%	Actual %	Success Dates
LSGW1				✓	40.5	Jul 11 – Oct 16
LSGW2				✓	52.9	Jul 10 – Nov 14
LSG1				✓	100.0*	Mar-18 – Nov 14
LSG2				✓	100.0*	Mar-18 – Nov 14
LSG3				✓	100.0*	Mar-18 – Nov 14
LSG4				✓	100.0	Mar-18 – Nov 14

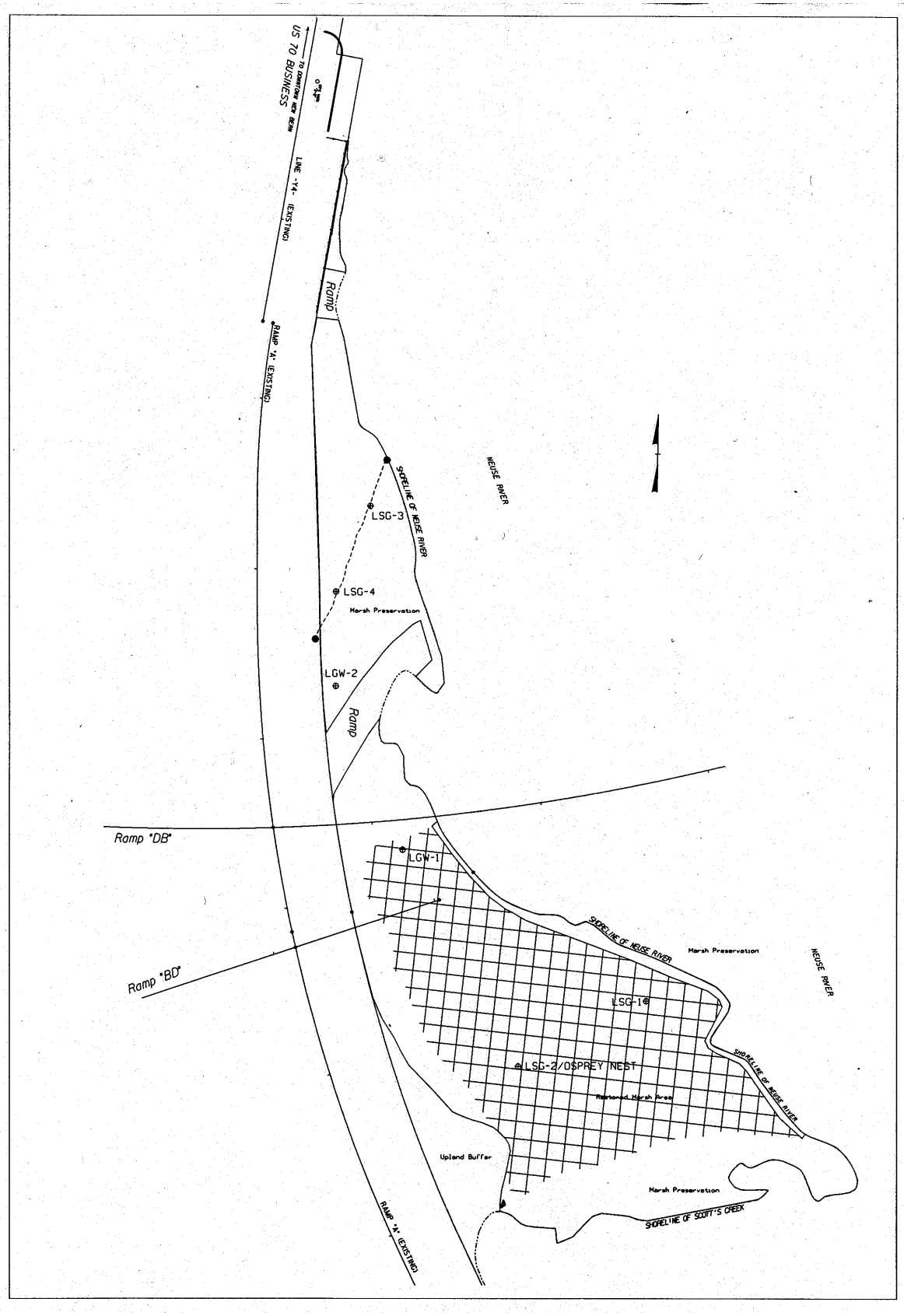
Shaded gauges are reference gauges.

* While LSG-4 did show inundation (water levels remained just above the ground surface for the entire season), the remaining three gauges showed water levels that fluctuated around the ground surface elevation for most of the season. These gauges were saturated within 12 inches of the surface for the entire season and did show inundation for at least 25% of the season as required.

Specific Gauge Problems: LSGW-1 malfunctioned on October 16, 2002; the gauge was repaired and reset to read on November 16, 2002.

Appendix A contains charts of the water depth for each surface and groundwater gauge during 2002. The groundwater monitoring gauge graphs are designed to show the reaction of groundwater to specific rainfall events. All significant saturation periods are noted on the groundwater gauge graphs, as are daily precipitation events measured at the New Bern rain gauge. Rainfall events are not included on the surface gauge graphs. These plots are designed to show periods of site inundation.

Figure 2. Lengyel Gauge Location Map



2.3.2 Climatic Data

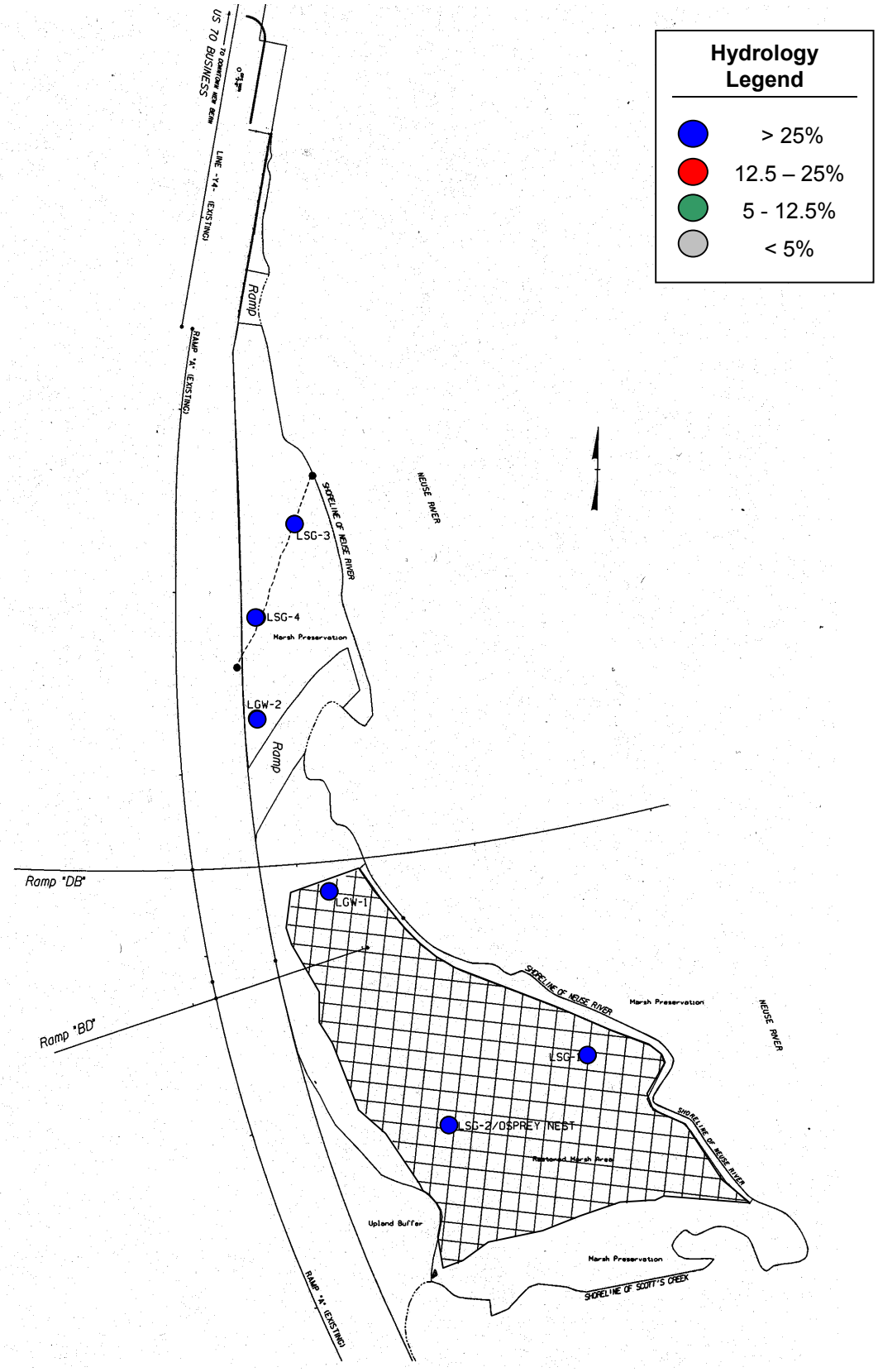
Figure 4 is a comparison of the 2002 monthly rainfall to the historical precipitation (collected between 1931 and 2002) for New Bern, North Carolina. This comparison gives an indication of how 2002 relates to historical data in terms of climate conditions. All off site data was provided by the NC State Climate Office. Data for November and December 2002 was unavailable at the time this report was published.

This graph is used to indicate the general precipitation conditions for the surrounding area. The data obtained indicates lower than normal precipitation February, April, May, and November, and above average precipitation for March and July. November and December 2001, January, June, August, September, and October experienced normal rainfall. Overall, the site maintained excellent hydrologic results in a year of average climatic conditions.

2.4 Conclusions

The year 2002 represents the fourth year of hydrologic monitoring for the Lengyel Mitigation Site. Surface water indicated continuous site inundation throughout the growing season at one of the gauges, with inundation for at least 25% of the growing season shown at the remaining three surface gauges. Data collected from the onsite groundwater gauges showed continuous saturation for a period exceeding 25% of the growing season. The 2002 data was collected during a year of average rainfall totals. NCDOT will continue to monitor the site.

Figure 3. 2002 Lengyel Hydrologic Monitoring Results



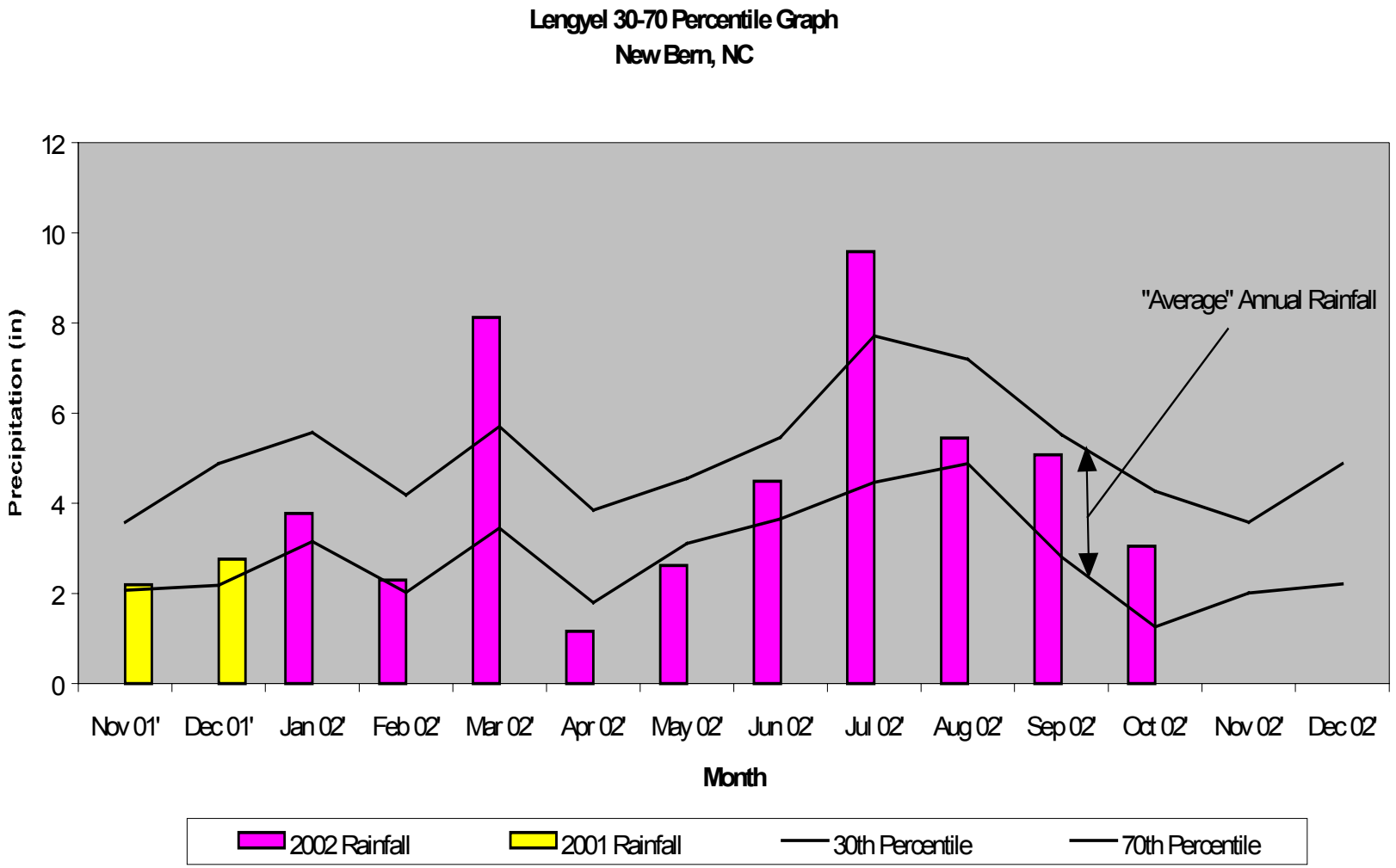


Figure 4. Lengyel Site 30-70 Percentile Graph, New Bern, NC

3.0 VEGETATION

3.1 Success Criteria

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. Monitoring plots found to be located within the open water channel will not be evaluated, and will not count toward the final count of plots. The vegetation component of the wetland site will be deemed successful if the following criteria are met: at year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.

A minimum of 70% of the plots shall contain the target (planted) species.

3.2 Description of Planted Areas

The following plant communities were planted in the Marsh Grass Area:

Marsh Planting: (approximately 2.46 hectares)

Spartina cynosuroides, Big Cordgrass

3.3 Results of Vegetation Monitoring

ZONE	Plot #	Scale Factor	*Spartina cynosuroides*	*Scirpus* sp.	*Juncus* sp.	Frequency (Big Cordgrass only)	Notes
	1	5.0					Baccharis halimifolia, Ragweed, Lespedeza, Winged Elm, *Galium* sp.
	2	4.0			✓		Goldenrod
	3	5.0		✓			Pennywort, *Aster* sp., *Sagittaria* sp.
	4	5.0			✓		Goldenrod
	5	5.0		✓	✓		Goldenrod, Pennywort
	6	5.0			✓		Goldenrod
	7	5.0			✓		*Baccharis halimifolia*, Ragweed, Pennywort, *Aster* sp.
	8	5.0			✓		Goldenrod, *B. halimifolia*, Pennywort, *Verbena* sp, *Panicum* sp.
	9	5.0		✓			*Pluchea* sp., Pennywort
	10	5.0			✓		Goldenrod, *Baccharis halimifolia*, Pennywort
	11	2.0		✓			*Baccharis halimifolia*, Pennywort
	12	5.0			✓		Goldenrod, *Baccharis halimifolia*
	13	5.0			✓		*Myrica* sp., *Baccharis halimifolia*, Goldenrod
	14	5.0			✓		*Alternanthera philoxeroides*, Pennywort, Goldenrod
	15	5.0			✓		*Polygonum* sp., *Kosteletzkya* sp., Pennywort, *Pluchea* sp.
	16	5.0		✓	✓		*Baccharis halimifolia*, Ragweed, Pennywort, *Aster* sp.
	17	5.0		✓			Pluchea sp., Pennywort
	18	5.0			✓		*Polygonum* sp., Goldenrod, *Pericum* sp.
	19	5.0			✓		Goldenrod, *Baccharis halimifolia*
	20	5.0	✓		✓	✓	*Aster* sp., *Kosteletzkya* sp.
	21	5.0			✓		Goldenrod, *Baccharis halimifolia*
	22	4.0					*Panicum virgatum*, *B. halimifolia*, *Eupatorium* sp.,
	23	5.0			✓		Goldenrod
	24	5.0		✓			Goldenrod, *Baccharis halimifolia*, *Ampelopsis arborea*
	25	5.0		✓			*Kosteletzkya* sp., Pennywort, *Polygonum* sp., *Typha* sp.
	26	5.0			✓		Goldenrod, *Baccharis halimifolia*
	27	4.0					*Panicum virgatum*, *B. halimifolia*, Goldenrod
	28	5.0		✓	✓		Goldenrod, *Baccharis halimifolia*
	29	5.0	✓	✓	✓	✓	Goldenrod, *Baccharis halimifolia*
	30	5.0					Goldenrod, *Baccharis halimifolia*, *Myrica* sp., *Kosteletzkya* sp.
	31	5.0					*Verbena* sp., *Myrica* sp., Lespedeza, Poison Ivy,
	32	5.0		✓			Goldenrod, Pennywort, *Hypericum* sp., *Pluchea* sp.
	33	5.0					*Verbena* sp., Lespedeza, Goldenrod, Fennel, *Oenothera* sp.
	34	5.0			✓		Goldenrod, Ragweed
	35	5.0			✓		Goldenrod, *Typha* sp., Pennywort, *Baccharis halimifolia*
	36	5.0	✓	✓		✓	Pennywort, *Hibiscus* sp., *A. philoxeroides*, *Hydrocytle* sp., *Aster* sp.
	37	5.0	✓		✓	✓	Goldenrod, Pennywort, *Polygonum* sp.
	38	5.0		✓	✓		Goldenrod, Pennywort
	39	5.0			✓		Pennywort, *Aster* sp., *Typha* sp., *Mikania scandens*, *Cyperus sp.*
	40	5.0			✓		*Myrica* sp., *Baccharis halimifolia*, Goldenrod
	41	2.0		✓			*Baccharis halimifolia*, Pennywort
	42	5.0					Verbena sp., Goldenrod, *Baccharis halimifolia*
	43	5.0					Black willow, *Panicum virgatum*
	44						Open Water
	45	5.0					Pennywort, *Pluchea* sp., *Sagittaria* sp., *Aster* sp., *Hydrocoytle* sp.

ZONE	Plot #	Scale Factor	*Spartina cynosuroides*	*Scirpus* sp.	*Juncus* sp.	Frequency (Big Cordgrass only)	Notes
	46	5.0		✓	✓		Goldenrod, *Panicum virgatum* , *Baccharis halimifolia*
	47	5.0					*Panicum virgatum* , *Hibiscus* sp., *Polygonum* sp., Pennywort, Ragweed
	48	3.0		✓	✓		Pennywort, *Baccharis halimifolia* , Goldenrod, *Eupatorium* sp.
	49	5.0		✓	✓		*Polygonum sp., Pluchea sp.,* Pennywort, *Kosteletzkya sp.*
	50	5.0		✓			*P. virgatum* , *Polygonum* sp., Pennywort, *Aster* sp., *Mikania scandens*
	51	5.0					*Pluchea* sp., *Polygonum* sp., *Alternanthera philoxeroides* , Goldenrod
	52	5.0		✓			Goldenrod, Pennywort
	53	5.0			✓		Goldenrod, Pennywort, *Baccharis halimifolia*
	54	5.0			✓		Black willow, *Verbena* sp., *Myrica* sp., *Baccharis halimifolia*
	55	5.0			✓		Lespedeza, *Verbena* sp., *Hibiscus* sp.
	56	5.0					*Panicum virgatum* , *Hibiscus* sp., *Polygonum* sp., Pennywort, Ragweed
	57	5.0	✓	✓	✓	✓	*Aster* sp., *Pluchea* sp., *Typha* sp.
	58	5.0		✓			*Sagittaria* sp., *Polygonum* sp., *Aster* sp., Pennywort
	59	5.0		✓	✓		Pennywort, *Polygonum* sp.
	60	5.0			✓		Goldenrod, Ragweed
	61	5.0			✓		Goldenrod
	62						Open Water
	63	5.0		✓			*Hypericum* sp., *Polygonum* sp., *Alternanthera philoxeroides* , *Aster* sp.
	64						Open Water
	65	4.0			✓		Black willow, Goldenrod, *B. halimifolia*
	66	5.0		✓			*Pluchea sp., Pennywort*
	67	5.0		✓			Goldenrod
	68	5.0					Goldenrod, *Hibiscus* sp., *Verbena* sp., *Myrica* sp., *P. virgatum*
	69	5.0			✓		Goldenrod, *B. halimifolia*
	70	5.0		✓	✓		*Polygonum* sp., *Aster* sp., *Mikania scandens, Verbena sp., B. halimifolia*
	71	4.0					*P. aciculare, P. virgatum, Eupatorium sp., B. halimifolia*
	72	5.0		✓			*Pluchea sp., Pennywort*
	73	5.0			✓		Goldenrod, *Pluchea* sp., Pennywort
	74	5.0			✓		Goldenrod
	75	5.0		✓			Pennywort, *Mikania scandens* , *Pluchea* sp., *Verbena* sp.
	76	5.0			✓		Goldenrod, Ragweed
	77	5.0			✓		*Myrica* sp., Blackberry, Goldenrod, Pennywort
	78	4.0	✓	✓		✓	Pennywort, *Baccharis halimifolia*
	79	5.0	✓			✓	*Sagittaria* sp., *Kosteletzkya* sp., Pennywort
	80	5.0	✓			✓	*A. philoxeroides* , *Pluchea* sp., *Aster* sp., *Polygonum* sp.
	81	5.0		✓			*Polygonum* sp., *Pluchea* sp., *A. philoxeroides* , *Hypericum* sp., Pennywort
	82	5.0			✓		*Cyperus* sp., Ragweed, *B. halimifolia* , *Verbena* sp., Pennywort
	83	5.0			✓		Goldenrod, *Baccharis halimifolia*
	84	5.0		✓			*Aster* sp., *Polygonum* sp., *A. philoxeroides*
	85	5.0			✓		*Aster* sp., *Polygonum* sp., *A. philoxeroides*
	86	3.0			✓		Eupatorium *sp., P. virgatum,* Pennywort
	87	3.0			✓		Eupatorium *sp., P. virgatum,* Pennywort
	88	5.0			✓		Goldenrod, *B. halimifolia* , Pennywort, *Verbena* sp, *Panicum* sp.
	89	3.0			✓		*Eupatorium sp., P. virgatum, Pennywort*
	90	4.0			✓		*Sagittaria* sp., *Typha* sp.

ZONE	Plot #	Scale Factor	*Spartina cynosuroides*	*Scirpus* sp.	*Juncus* sp.	Frequency (Big Cordgrass only)	Notes
	91	5.0	✓	✓		✓	*Ptilimnium* sp., 10" water
	92	4.0					*Carex* sp., Fennel, Goldenrod, *Baccharis* sp.
	93	5.0		✓			*Ptilimnium* sp., L.L. Sagittaria, Goldenrod
	94						open water
	95	5.0			✓		Smartweed, Goldenrod, *Ptilimnium* sp., L.L. Sagittaria
	96						open water
	97						open water
	98	5.0	✓			✓	*Aster* sp., Smartweed
	99	4.0		✓			*Aster* sp., *Pluchea* sp., *Rotala* sp., Blue stem
	100	5.0		✓			*Ptilimnium* sp.
	101	5.0	✓	✓		✓	*Aster* sp., Smartweed
	102	5.0		✓			*Aster* sp., *Baccharis* sp.
	103	5.0	✓			✓	Smartweed, *Ptilimnium* sp.
	104	5.0	✓			✓	*Ptilimnium* sp., *Juncus* sp., Goldenrod, L.L. Sagittaria
	105	5.0	✓		✓	✓	Goldenrod, *Ptilimnium* sp.
	106	5.0	✓			✓	Goldenrod, *Ptilimnium* sp., *Baccharis* sp.
	107	5.0	✓	✓		✓	Fennel, Goldenrod, Black willow
	108						open water
	109	5.0	✓		✓	✓	Pennywort, *Ptilimnium* sp.
	110	5.0					Fennel, Goldenrod
Frequency (Percentage of Plots with Desired Specie)			68.4%	60.2%	19.4%	68.4%	
Sum Scale Value						476	
Total Number of Plots						98	
Vegetative Cover (Scale Value)						4.9	

Site Notes: Site appears to be converting to mostly *Juncus* and *Scirpus* species. 39.3% frequency of *Scirpus* sp., and 58% frequency of *Juncus* sp.

3.4 Conclusions

- Percent Frequency of Target Species (Big Cordgrass) **11.2%**
  Frequency of 70% required.

- Vegetative Cover Scale Value **4.7**
  Scale Value of 5 required for year 5.

Of the 4.8 hectares (11.9 acres) of this site, approximately 2.46 hectares (6.1 acres) involved marsh planting. The percent frequency of target species does not meet the success criteria. The cover scale value is on target for the fourth year of monitoring. Based on the 2002 vegetation monitoring, the frequency of *Spartina cynosuroides* is decreasing. However, the site appears to be converting to a marsh system dominated primarily by *Juncus* species (58.0% frequency) and *Scirpus* species (39.3% frequency).

The 2002 vegetation monitoring revealed a combined frequency of 86.0% for *Spartina cynosuroides*, *Juncus* sp., and *Scirpus* sp. Based upon this combined frequency, NCDOT feels that the mitigation goals for the vegetation restoration as stated in the Final Wetland Mitigation Plan (August 2000) are still being met. The open water channel within the site was measured with GPS equipment in 2001 and is shown on the attached map.

NCDOT will continue vegetation monitoring at the Lengyel Mitigation Site.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

- Hydrology has met the success criteria for the fourth year.

- Although the percent frequency of target species did not meet the success criteria, the site is establishing wetland vegetation. The vegetation cover scale value has significantly increased and is on target to meet the success criteria in 2002.

- Monitoring should continue for both hydrology and vegetation.

APPENDIX A

SURFACE AND GROUNDWATER GAUGE PLOTS

APPENDIX B

SITE PHOTOS

LENGYEL

Photo 1

Photo 2

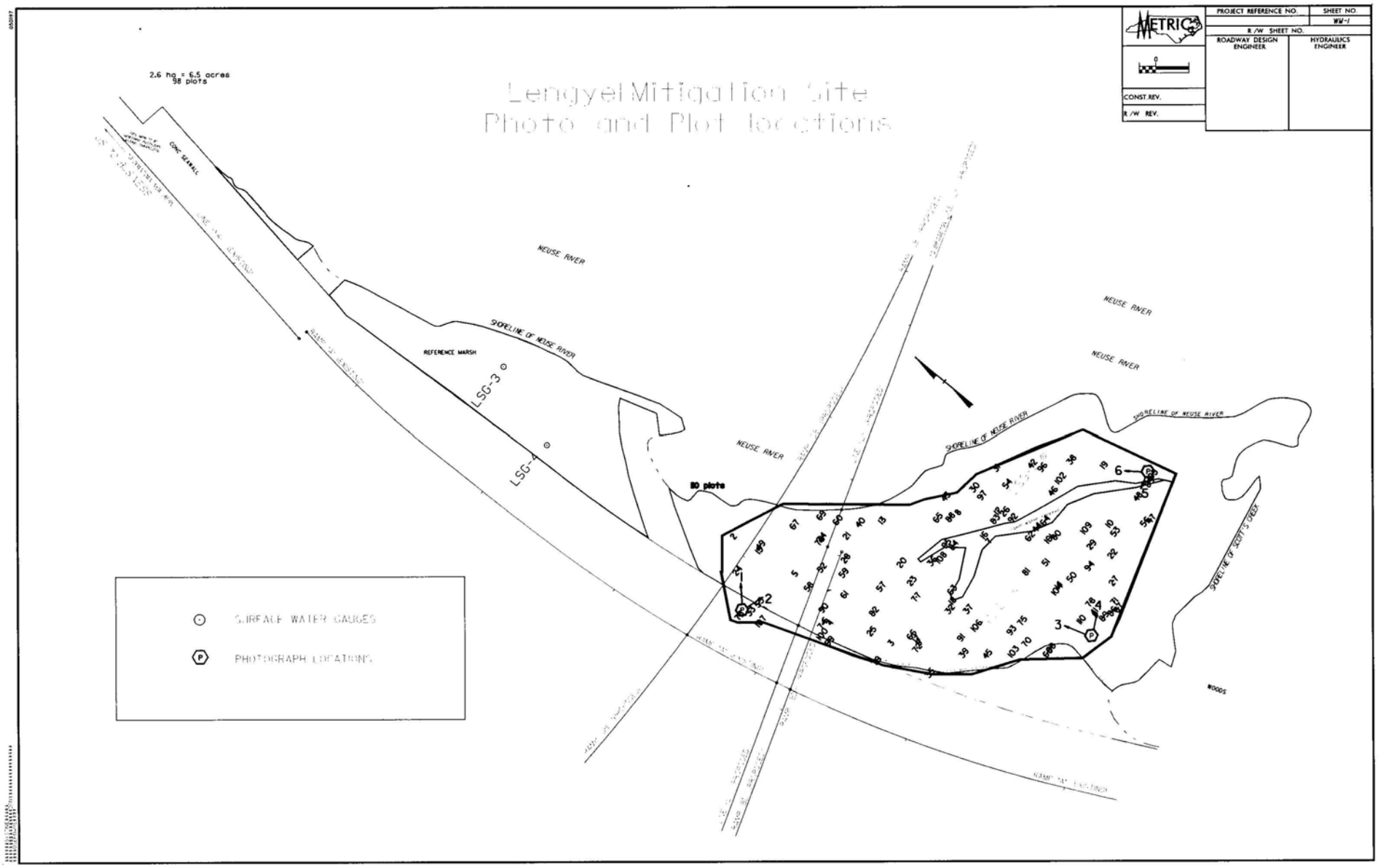
Photo 3

Photo 4

Photo 5

Photo 6

2002


Lengyel Mitigation Site
Photo and Plot locations
2.6 ha = 6.5 acres
98 plots
CONC. SEAWALL
NEUSE RIVER
SHORELINE OF NEUSE RIVER
REFERENCE MARSH
LSG-3
LSG-4
80 plots
SHORELINE OF SCOTT'S CREEK
WOODS
SURFACE WATER GAUGES
PHOTOGRAPH LOCATIONS
METRIC
CONST. REV.
R/W REV.
PROJECT REFERENCE NO.
SHEET NO.
WW-1
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER